

Examiner, and withdrawal of the rejections is respectfully requested. Specifically, in claim 1 Applicant has deleted the phrase “said enlarged distal portion being at least partially within,” in reference to the fluid supply passage. The limitation “substantially blocking” is recited in claim 1. Reference is made to Figure 1, which illustrates distal portion 22 proximate the end of the passage 18. When in a closed position, distal portion 22 mates with the end of the passage 18, and substantially blocks fluid flow into or out of the mold cavity. Claim 7 has also been amended, deleting the phrase “positioned at least partially within,” similar to claim 1. Claim 11 recites the phrase “substantially blocking said passage at said retracted position,” and is therefore in conformity with claims 1 and 7 with respect to the relationship between the distal portion of the pin and the passage. All the issues raised with regard to §112 are therefore believed resolved, and withdrawal of the subject rejections to claims 1, 7 and 11 is respectfully requested.

Rejections Under §102

Claim 11 stands rejected under §102(b) as being anticipated by Daniels et al. Applicant has amended claim 11 to recite limitations not taught by Daniels, and the rejection is therefore overcome. In particular, claim 11 has been amended to recite the following limitation(s):

wherein said pin can be extended or retracted by any of: adjusting fluid pressure at said first pressure surface, adjusting fluid pressure at said second pressure surface, or adjusting fluid pressure at both of said first and said second pressure surfaces.

Thus, as amended, claim 11 encompasses a pin that can be extended by raising the fluid pressure supplied to the enlarged distal portion (the first pressure surface), or by raising the fluid pressure at the second pressure surface. Similarly, the pin can be retracted by reducing either of the fluid pressures. A third alternative allows the pin to be retracted and/or extended by varying both of the fluid pressures.

Daniels does not teach a pin as set forth in claim 11, rather, Daniels is directed to devices capable of reciprocating and extending the fluid injection apparatus with only one of a cylinder or pressurized gas, not either, as in the presently claimed invention (See Daniels Abstract). At column 4, lines 15-21, the operation of Daniels' injection pin 56 is discussed:

Pressurized gas in chamber 62 acts against end face 58 and forces injection pin 56 upwardly through distance d until it abuts second stop 66. Gas from port 60 communicates through radial passage 68 to axial passage 70, second radial passage 72, and into chamber 74.

This description is continued at column 4, lines 33-36:

When injection pin 56 is in the extended position moved upwardly through the distance d, gas may be delivered from chamber 74 and into notch 78 at the outer periphery of injection pin 56.

As set forth in the Daniels specification, pin 56 must first be extended with gas pressure at end face 58. Only then can gas flow through radial passage 68 to deliver gas to the mold 26. Daniels' Figure 9 illustrates the structural details responsible for this limitation.

In Figure 9, the port that allows gas entry to passage 68 is covered by the side wall of piston 64 when pin 56 is in its retracted position. As pin 56 is extended, the port is uncovered, allowing gas to pass from port 60 to the port leading to passage 68. Thus, Daniels does not teach all the limitations of the invention of claim 11, namely, an apparatus wherein the pin can be extended or retracted by plural means, the rejection is overcome, and withdrawal of the same is respectfully requested.

Rejections Under §103

Claims 1, 2 and 5 are rejected under §103(a) as unpatentable over Daniels et al. in view of Carroll. Applicant has amended claim 1, from which claims 2 and 5 depend, to recite limitations not taught by the proposed combination of references, and the rejections are therefore overcome. In particular, amended claim 1 recites the following limitations:

[A] pressure surface on said distal portion...

said pin being reciprocable between its extended and retracted positions with fluid at said pressure surface; and

an actuator operably coupled to a proximal end of said pin, said pin being reciprocable between its extended position and retracted position with said actuator; and

said actuator operable to reciprocate said pin in cooperation with said pressurized fluid.

The examiner suggests modifying Daniels with the addition of a pin having a tapered end such as that taught by Carroll. Even if one were to make this modification, the combination would not teach a device with all the limitations of claim 1, and the suggested combination cannot support a prima facie case of obviousness.

Adding an enlarged distal portion to the pin of Daniels, as the Examiner suggests, would not allow actuation of the pin according to the three alternative actuation methods of the claim 1 design. Similar to the discussion with respect to claim 11, Daniels teaches a system wherein gas pressure at surface 58 extends the pin a distance “d”, after which gas delivery to the mold chamber via notch 78 can begin. Until pin 56 is moved the requisite distance, however, gas delivery to the mold is blocked.

Applicant’s claimed invention contrasts significantly with the Daniels design. For example, Applicant’s invention allows an initial burst of pressurized fluid acting on the pressure surface of distal portion 22 to extend the pin into the mold cavity, rapidly initiating fluid injection. Moreover, the actuator can be operated to hold rod 22 in a retracted position, allowing fluid to build or be maintained at a high level in supply passage 16 prior to beginning fluid injection. Daniels discloses two alternative designs for actuating the pin, however, neither design offers the flexibility of Applicant’s invention. In the first Daniels design, wherein the pin is actuated with the cylinder, sufficient fluid pressure must be applied to surface 58 to move the cylinder distance “d” before the fluid supply to the mold is even opened. Even then, the fluid supply passages to the mold are at atmospheric pressure, and a delay is necessary before high pressure fluid can be delivered to the mold cavity. In contrast, Applicant’s invention can provide high-pressure fluid to the mold at the instant that rod 22 is actuated, decreasing molding cycle time. The second Daniels design, wherein the pin is actuated by fluid pressure at surface 83, has similar limitations in that the fluid pressure maintained in the fluid supply line proximate the mold must be kept below the pressure required to extend the pin. When mold pressurization is desired, there can be a significant time delay while the

supply line is pressurized to a level sufficient to extend the pin, and a further delay while the mold pressure is elevated to the desired level. Thus, Applicant's invention can provide faster response times than either of the disclosed Daniels designs. In addition to faster response, rod 22 can be held at varying positions with the actuator, allowing the size of the outlet to be varied, and a correspondingly varying amount of fluid injected per unit time (page 4, lines 7-8). Consequently, the combination of Daniels and Carroll does not teach all the limitations of the claimed invention, nor does the combination present the advantages in efficiency or flexibility in operation associated with Applicant's invention, as set forth in claim 1. The rejections to claim 1, and the claims dependent thereto are therefore overcome, and withdrawal of the same is respectfully requested.

Claim 4 stands rejected under §103(a) as unpatentable over Daniels in view of Carroll, and further in view of Denne. For the reasons set forth above with respect to claim 1, from which claim 4 depends, namely, that the proposed combination does not teach all the limitations of the present invention, the rejection is overcome, and withdrawal of the same is respectfully requested.

Claim 6 stands rejected as unpatentable over Daniels in view of Carroll and further in view of Terao. For the reasons set forth above with respect to claim 1, from which claim 6 depends, namely, that the proposed combination does not teach all the limitations of the present invention, the rejection is overcome, and withdrawal of the same is respectfully requested.

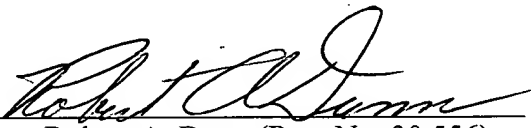
Claims 7 and 8 stand rejected as unpatentable over Daniels in view of Denne. The Examiner states that it would have been obvious to one of skill in the art to modify Carroll with the substitution of an electronic actuator as taught by Denne. Given the

initially stated basis for the rejection (i.e. Daniels in view of Denne), Applicant assumes that the Examiner intended to recite "Daniels" instead of "Carroll," however, none of the cited references, alone or in combination, can form the basis for a valid obviousness rejection of amended claim 7 anyway. Claim 7 has been amended to recite "said pin being reciprocable with one or more of: gas pressure at said enlarged distal portion; and said electronic actuator." Thus, in the invention of claim 7, the pin is reciprocable with gas pressure, the electronic actuator, or both. The proposed combination therefore does not teach all the limitations of the presently claimed invention. The rejections to claims 7 and 8 are therefore overcome, and withdrawal of the same is respectfully requested.

WHEREFORE, all the claims of the present application are believed to be in condition for allowance, which is respectfully solicited. If the Applicant may provide further information or assist in the prosecution of this application in any way, the assigned examiner is invited to contact the undersigned at (248) 364-2100.

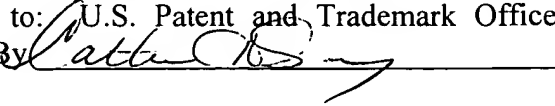
Respectfully submitted,

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APPENDIX

Marked up version of claims illustrating changes:

1. (PREVIOUSLY AMENDED) A nozzle for the injection of fluid into a molding chamber comprising:

a hollow passage having a distal end for connecting a pressurized fluid supply to the interior of said chamber; and

a pin extending through said passage and reciprocal between an extended position and a retracted position, said pin having an enlarged distal portion [extending beyond the distal end of said passage, said enlarged distal portion being at least partially within and] substantially blocking said passage when said pin is in its retracted position, and having a pressure surface on said distal portion exposed to pressurized fluid supplied via said passage, said pin being reciprocable between its extended and retracted positions with fluid at said pressure surface; and

an actuator operably coupled to a proximal end of said pin, said pin being reciprocable between its extended position and retracted position with said actuator; and

said actuator operable to reciprocate [reciprocating] said pin in cooperation with said pressurized fluid.

7. (PREVIOUSLY AMENDED) A gas assisted injection molding apparatus comprising:

a molding chamber;

a supply of pressurized gas;

a hollow conduit communicating with said gas supply and extending into said chamber;

a pin extending through said conduit and reciprocal between an extended position and a retracted position, said pin having an enlarged distal portion [positioned at least partially within and] substantially blocking said conduit at said retracted position; and

an electronic actuator operably coupled to said pin [reciprocating said pin in cooperation with gas supply pressure];

said pin being reciprocable with one or more of gas pressure at said enlarged distal portion and said electronic actuator.

11. A nozzle for the injection of fluid into a molding chamber comprising:

a hollow passage having a first end for connecting a pressurized fluid supply to the interior of said chamber;

a pin extending through said passage and reciprocal between an extended position and a retracted position;

a first end of said pin having an end portion with a first pressure surface, said end portion matingly received by said first end of said passage, substantially blocking said passage at said retracted position;

a second end of said pin includes a second pressure surface, said second end extending into a variable pressure fluid reservoir [variation of pressure in said reservoir reciprocating said pin in cooperation with fluid pressure on said end portion,];

wherein said pin can extended or retracted by any of adjusting fluid pressure at said first pressure surface, adjusting fluid pressure at said second pressure surface, or by adjusting fluid pressure at both of said first and said second pressure surfaces.